



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/563,332	06/08/2006	Matthias Blessing	095309.57216US	6776
23911	7590	11/09/2006	EXAMINER	
CROWELL & MORING LLP INTELLECTUAL PROPERTY GROUP P.O. BOX 14300 WASHINGTON, DC 20044-4300			GIMIE, MAHMOUD	
			ART UNIT	PAPER NUMBER
			3747	

DATE MAILED: 11/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	10/563,332	BLESSING ET AL.
	<b>Examiner</b>	<b>Art Unit</b>
	Mahmoud Gimie	3747

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 08 June 2006.
- 2a) This action is FINAL.                  2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 14-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 14-26 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 30 December 2005 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some \* c) None of:
1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/30/05</u>  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 14-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Shafer et al. (US 2003/0066509 A1).

Shafer et al. disclose an internal combustion engine (10), comprising a control unit; a combustion space formed between a piston (26) and a cylinder head (not numbered); and a fuel injection device (30) with an injection nozzle (31), which has a nozzle needle and a plurality of injection bores (726, 728), wherein the injection nozzle is arranged to inject fuel into the combustion space in the form of a plurality of fuel jets (figures 1b and 1c) as at least one of a main injection, pre-injection and post-injection, the nozzle needle is arranged to permit fuel injection selectively (figures 18a-18c) through at least two separate groups of said injection bores, and the control unit is programmed to control an operating stroke of the nozzle needle as a function of at least one of a piston position and an operating point of the internal combustion engine (par. 0035-0037); see figures 1a-1c and 18a-18c.

Regarding claim 15, wherein each of the at least two separate groups of bores are arranged in the rows about a circumference of the injection nozzle, and at least one row

Art Unit: 3747

of bores has a fuel injection cone angle which is different from a fuel injection cone angle of a different row of bores.

Regarding claim 16, wherein a first row of bores is activated during main injection and a second row of holes is activated during at least in of pre-injection and post-injection, and the first row fuel injection cone angle is greater than the second row fuel injection cone angle.

Regarding claim 17, wherein a fuel injection pressure is set as a function of at least one of the piston position and the operating point.

Regarding claim 18, wherein the operating stroke of the nozzle needle is controlled by the control unit (17) to form an unstable cavitating flow in the injection bores

Regarding claim 19, wherein the engine is configured to produce a gas swirl movement in the combustion space.

Regarding claim 20, wherein the nozzle needle is controlled to inject fuel in one of a continuous or an intermittent manner while the gas swirl movement is present in the space, such that the injected fuel is laterally displaced relative to the fuel injection device by the swirl movement.

Regarding claim 21, wherein the operating stroke of the nozzle needle of the injection nozzle needle is controlled to provide an effective flow cross section between the nozzle needle and a nozzle needle seat amounting to about 0.8 to 1.2 times an effective flow cross section of the sum of all the injection bores.

Regarding claim 22, wherein the fuel injection cone angle of each injection bore is between 60° and 160° ( $\alpha$  ).

Art Unit: 3747

Regarding 23, wherein the operating stroke of the nozzle needle is set by one of a two-spring holder and a piezoelectric actuator.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shafer et al. (US 2003/0066509 A1) in view of Konig et al. (US 2002/0083920 A1).

Shafer et al. disclose all the limitations as applied to claims 14-23 above, except a dish-shaped piston recess and a projection extending from the center.

Konig et al. disclose a dish-shaped piston recess and a projection extending from the center.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the invention of Shafer et al. by replacing the piston of Shafer et al. with a dish-shaped piston recess and a projection extending from the center as disclosed by Konig et al. The motivation to do so would have been to create strong turbulence, see par. 0006 of Konig et al.

***Conclusion***

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited references show fuel injectors with multiple spray patterns.

Art Unit: 3747

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mahmoud Gimie whose telephone number is 571-272-4841. The examiner can normally be reached on Monday-Friday between 7 a.m. -3:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen K. Cronin can be reached on 571-272-4536. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MG



MAHMOUD GIMIE  
PRIMARY EXAMINER